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IS 410 (1977): Cold rolled brass sheet, strip and foil [MTD
8: Copper and Copper Alloys]



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IS : 410 - 1977
(Reaffirmed 2006)

Indian Standard

**SPECIFICATION FOR
COLD ROLLED BRASS SHEET,
STRIP AND FOIL**

(*Third Revision*)

Sixth Reprint JULY 2006
(Including Amendment No. 1)

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

AMENDMENT NO. 1 APRIL 1981
TO
IS:410-1977 SPECIFICATION FOR COLD ROLLED
BRASS SHEET, STRIP AND FOIL

(Third Revision)

Alteration

(Page 9, clause 8.2) - Substitute the following
for the existing clause:

'8.2 The dimensions may be either as specified in
IS:3052-1974* or as agreed between the manufacturer
and the purchaser.'

(SMDC 11)

Indian Standard

SPECIFICATION FOR COLD ROLLED BRASS SHEET, STRIP AND FOIL

(Third Revision)

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Indian Standard
SPECIFICATION FOR
COLD ROLLED BRASS SHEET,
STRIP AND FOIL
(*Third Revision*)

0. FOREWORD

0.1 This Indian Standard (Third Revision) was adopted by the Indian Standards Institution on 28 December 1977, after the draft finalized by the Copper and Copper Alloys Sectional Committee had been approved by the Structural and Metals Division Council.

0.2 This standard was first published in 1953 and was subsequently revised in 1959 and 1967. In this revision, the main modifications introduced are given below:

- a) In order to bring the standard in line with other International Standards on the subject, it has been specified that for all grades, nickel shall not be counted as copper but as an impurity because the presence of higher percentage of nickel affects annealability of the material;
- b) The requirements for brass plates have been excluded and will be covered in a separate standard;
- c) Data on the Erichsen Cupping test and grain size have been incorporated for guidance as material covered by the specification is used for a number of industrial applications;
- d) Hardness test has been made mandatory where both tensile and hardness requirements are specified in the standard;
- e) A comprehensive table on mechanical properties for the three alloys has been included relating it to the thickness of the material. A separate table on mechanical properties has been included for telecommunication industries;
- f) A clause on manufacture has been deleted; and
- g) Temper designations of the material have been brought in line with IS : 2378-1974*.

*Code for designation of copper and copper alloys.

0.3 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard covers the requirements of three alloys of cold rolled brass sheet, strip and foil required for engineering and general purposes and designated as CuZn30, CuZn37 and CuZn40.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions as given in IS : 3288 (Part I)-1973† shall apply.

2.1 Sheet — Flat product, of exact length, over 0.16 mm thick and up to and including 10 mm thick and over 300 mm wide.

2.2 Strip — Flat product over 0.16 mm thick and up to and including 10 mm thick, of any width, and generally not cut to length; usually in coil, but may be flat or folded.

2.3 Foil — A flat product of thickness up to and including 0.16 mm of any width generally not cut to length; usually in coil form but may also be in flat or folded form.

3. SUPPLY OF MATERIAL

3.1 General requirements relating to the supply of material shall be as laid down in IS : 1387-1967‡.

4. FREEDOM FROM DEFECTS

4.1 The sheet, strip and foil in the finished condition shall be clean, smooth, sound and free from surface or visible defects.

*Rules for rounding off numerical values (*revised*).

†Glossary of terms for copper and copper alloys: Part I Cast form and wrought form (main types) (*first revision*).

‡General requirements for the supply of metallurgical materials (*first revision*).

5. CONDITION

5.1 The material shall be supplied in the following conditions:

<i>Alloy Designation</i>	<i>Temper</i>
CuZn30 & CuZn37	Annealed (O); Quarter hard (HA); Half hard (HB), Hard (HD), Extra hard (HE); Spring hard (HS)
CuZn40	Annealed (O); Half hard (HB), Hard (HD).

6. CHEMICAL COMPOSITION

6.1 The material, when analyzed in accordance with IS : 3635-1966* shall have the chemical composition given in Table 1.

TABLE 1 CHEMICAL COMPOSITION

ALLOY DESIGNATION	PERCENTAGE				
	Cu	Pb Max	Fe Max	Total Impurities (Including Iron) Max	Zn
(1)	(2)	(3)	(4)	(5)	(6)
CuZn30	68.5 to 71.5	0.05	0.05	0.3	Remainder
CuZn37	61.5 to 64.5	0.30	0.075	0.6	Remainder
CuZn40	58.5 to 61.5	0.30	0.10	0.75	Remainder

7. MECHANICAL TESTS (INCLUDING PREPARATION OF TEST PIECES)

7.1 Where both tensile and hardness properties are specified (see Tables 2 and 3), they are to be regarded as alternatives and the hardness shall be taken as mandatory unless otherwise agreed. The following tests shall be made on test pieces selected as specified in 9.

7.1.1 *Tensile Test* — Whenever practicable, tensile tests shall be made on the full section of the material. Alternatively, a test piece of the full thickness of the material and machined to the dimensions of the 12 mm wide rectangular section test piece specified in IS : 2654-1964† shall be used. The longitudinal axis of symmetry of the test piece shall be in the direction of rolling. The elongation shall be measured on a gauge length of 50 mm. The tensile test shall not be applied to material 0.50 mm in thickness and less. The elongation test shall not be applied to strip thinner than 0.80 mm and less than 12 mm wide. The values obtained shall comply with the appropriate requirements given in Tables 2 and 3.

*Methods of chemical analysis of brasses.

†Method for tensile testing of copper and copper alloys.

TABLE 2 MECHANICAL PROPERTIES FOR OTHER THAN TELECOMMUNICATION INDUSTRIES

(Clause 7.1, 7.1.1, 7.1.2 and 7.1.3)

ALLOY DESIGNATION	CON-DITION	THICKNESS		TENSILE STRENGTH		ELONGATION ON GAUGE LENGTH OF 50 mm PERCENT Min	VICKERS HARDNESS (HV)			BEND TEST							
							Up to and Including 450 mm Wide			Transverse Bend		Longitudinal Bend					
		mm	mm	N/mm ² (kgf/mm ²)	Up to and Including 450 mm Wide		Over 450 mm Wide	Up to and Including 450 mm Wide	Over 450 mm Wide	Angle Radius deg	Angle Radius deg	Angle Radius deg					
(1)	CuZn30	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)			
		—	10	275 (28.0)	275 (28.0)	50	—	80	—	80	180	Close	180	Close			
		—	10	320 (32.5)	320 (32.5)	35	75	—	75	—	—	180	Close	180	Close		
		—	3.5 10	345 (35.0)	345 (34.0)	20	100	—	95	—	—	180	Close	180 t	180 t		
	CuZn37	—	10	405 (41.5)	380 (39.0)	5	125	—	120	—	—	90	2t	90	t		
		—	10	275 (28.0)	275 (28.0)	40	—	80	—	80	180	Close	180	Close	180	Close	
		—	10	335 (34.0)	320 (32.5)	30	75	—	75	—	—	180	Close	180	Close	180	Close
		—	3.5 10	380 (38.5)	345 (35.0)	15	110	—	100	—	—	180	Close	180 t	180 t	180 t	t

CuZn40	HD	—	10	450 (46.0)	405 (41.5)	5	135	—	125	—	90	2t	90	t
	HE	—	10	515 (52.5)	—	—	165	—	—	—	—	—	90	2t
	HS	—	5	660 (67.5)	—	—	185	—	—	—	—	—	90	2t
	O	—	10	275 (28.0)	275 (28.0)	30	—	85	—	85	180	Close	180	Close
	HB	—	10	420 (43.0)	420 (43.0)	12	100	—	100	—	180	t	180	t
	HD	—	10	490 (50.0)	490 (50.0)	5	125	—	125	—	90	2t	90	t

t = thickness of material.

7.1.2 Hardness Test — Hardness tests shall be made on test pieces taken from the samples selected as in 9 and shall be made in accordance with IS : 2866-1965*. The values obtained shall comply with the appropriate requirements given in Tables 2 and 3.

TABLE 3 MECHANICAL PROPERTIES (FOR TELECOMMUNICATION INDUSTRIES)

(*Clauses 7.1, 7.1.1 and 7.1.2*)

ALLOY DESIGNATION	CONDITION	WIDTH UP TO AND INCLUDING mm	TENSILE STRENGTH Min N/mm ² (kgf/mm ²)	ELONGATION ON GAUGE LENGTH OF 50 mm PERCENT Min	VICKERS HARDNESS (HV)	
					Min	Max
(1)	(2)	(3)	(4)	(5)	(6)	(7)
CuZn30	O	600	275 (28.0)	50	—	80
	HS	300	560 (57.0)	—	180	—
CuZn37	O	600	275 (28.0)	40	—	80
	HB	600	365 (37.0)	15	90	130
	HD	600	450 (46.0)	5	130	160
	HE	300	515 (52.5)	—	160	185
	HS	300	565 (57.5)	—	185	220

7.1.3 Bend Test — Where possible the material shall be subjected to a transverse bend test made on test piece cut with their major axes at right angles to the direction of rolling; where this is not possible, it shall be subjected to a longitudinal bend test, made on test pieces cut with their major axes parallel to the direction of rolling. Both surfaces of the test piece shall be tested. The test pieces shall not crack when bent once through the appropriate angle specified in Table 2. The bend tests shall be made in accordance with IS : 3260-1965†. The test pieces shall be of convenient length and the width shall be 12 mm for thickness up to 6 mm and twice the thickness for over 6 mm thickness.

7.1.3.1 The longer edges shall be carefully rounded and smoothed longitudinally so that for material up to 3.0 mm thick the cross section has approximately semi-circular edges; for material over 3.0 mm thick, the edges shall be rounded to a radius of 1.5 mm.

*Method for Vickers hardness test for copper and copper alloys.

†Bend test for copper and copper alloys.

7.1.4 Erichsen Cupping Values for Brass Sheet

7.1.4.1 If required by the purchaser, the minimum Erichsen values may be mutually agreed to between the manufacturer and the purchaser. However, minimum values are given in Appendix A for general guidance and should not be taken as mandatory.

7.1.5 Grain Size — The average grain size shall be as agreed to between the supplier and the purchaser. However, Vickers hardness values for annealed samples for different grain sizes are given in Appendix B for guidance. The material may be tested for grain size using the following tests:

For materials more than 75 mm wide, the outer surface of the dome of the Erichsen cupping test shall be free from roughness. For materials less than 75 mm wide the convex surface of the appropriate bend test (*see 7.1.3*) shall be free from roughness.

8. DIMENSIONS

8.1 The material may be supplied in coils, if consideration of width, thickness and temper permit, or in flat form, if so specified particularly.

8.2 The dimensions shall be as specified in IS : 3052-1974*.

8.3 The tolerances on the specified thickness, width and length shall be as specified in IS : 3052-1974*.

9. SAMPLING AND RETEST

9.1 Sampling — When tests are specifically called for by the purchaser, quantities of sheet (or strip) of the same width, thickness and temper shall be batched together. For each batch the number of samples taken shall be as given below:

The samples shall be cut off cold and shall receive no further treatment (except that they may be machined to the shape of the test piece) before being tested.

9.1.1 From batches weighing up to 1 000 kg the number of samples taken shall be in the proportion of one per 200 kg of material submitted, and fractional remainder being considered as 200 kg. Where strip is supplied in coils weighing more than 200 kg, one sample shall be taken from each coil to provide the necessary test pieces. If the purchaser requires more than one sample to be taken from any coil, the method of taking the additional sample or samples shall be agreed to between the supplier and the purchaser.

*Dimensions for wrought copper and copper alloys, sheet, strip and foil (for general engineering purposes) (*first revision*).

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9.1.2 Batches exceeding 1 000 kg shall be sub-divided into smaller batches of not less than 200 kg and not more than 1 000 kg to which the provision of **9.1.1** shall then supply.

9.2 Retests — Should any one of the test pieces first selected by the purchaser or his representative fail to pass any of the prescribed tests, two further samples from the same batch shall be selected for testing, one of which shall be from the sheet or strip from which the original test sample was taken, unless that sheet or strip has been withdrawn by the supplier. Should the test piece from both these additional samples pass, the batch represented by the test sample shall be deemed to comply with this standard. Should the test pieces from either of these additional samples fail, the batch represented by the test samples shall be deemed not to comply with this standard. The supplier shall, if required, certify that the sheet, strip or foil complies with the requirements of this standard appropriate to the material ordered.

10. PACKING

10.1 Sheet, strip or foil shall be packed in bundles, boxes or crates as agreed to between the purchaser and the manufacturer.

11. MARKING

11.1 Each bundle, box or crate shall be legibly marked with the name of the manufacturer or supplier, the alloy designation of the material, condition, dimensions and weight.

11.1.1 The product may also be marked with Standard Mark.

The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act, 1986* and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufactures or producers may be obtained from the Bureau of Indian Standards.

APPENDIX A(*Clause 7.1.4.1*)**MINIMUM ERICHSEN CUPPING VALUES
(FOR ANNEALED TEMPER ONLY)**

THICKNESS mm	ERICHSEN VALUE mm
0.1	10.19
0.15	10.5
0.2	10.8
0.25	11.05
0.3	11.31
0.35	11.5
0.4	11.65
0.5	12.01
0.6	12.23
0.7	12.42
0.8	12.59
0.9	12.8
1.0	13.0
1.2	13.3
1.5	13.7
1.8	14.1
2.0	14.3

APPENDIX B(*Clause 7.1.5*)**GRAIN SIZE**

ALLOY DESIGNATION	GRAIN SIZE			VICKERS HARDNESS (HV) <i>Max</i>
	<i>Nominal</i>	<i>Min</i>	<i>Max</i>	
CuZn30	0.120	0.070	—	60
	0.070	0.050	0.120	65
	0.050	0.035	0.070	70
	0.035	0.025	0.050	75
	0.025	0.015	0.035	80
CuZn37	0.035	0.025	0.050	75
	0.025	0.015	0.035	80

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